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ABSTRACT

D. B. Bailey and S. A. Palsha (1992) proposed two modified versions of the Stages of Concern Questionnaire for measuring teacher concerns during a reform effort. Their analysis suggested the use of a 5-factor model with 35 items or 15 items rather than the original 7-stage, 35-item Concerns Based Adoption Model (CBAM). The present study was carried out in two phases. The first phase analyzed data from 376 algebra teachers to evaluate reliability and validity issues of both the original Stages of Concern Questionnaire and the two proposed versions of Bailey and Pasha. Reliability estimates were lower for the 15-item revised version, but agreed with Bailey and Palsha for the original instrument and the 35-item, 5-factor version. A confirmatory factor analysis was conducted using the 5-factor, 35-item version. A less than optimal fit of the model to the data indicated continued problems with validity. From factor loadings and modification indices, a 27-item 5-stage model was proposed that more closely matched the original CBAM without the Awareness and Refocusing Stages. The second phase of the study employed a confirmatory factor analysis of the 27-item 5-stage model to examine data from a new sample of 237 algebra teachers. Reliability estimates were consistently higher than for other versions, but validity continued to be problematic. A broad range of issues arising from these results is discussed. (Contains 8 tables and 14 references.) (Author/SLD)

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An Analysis of the Validity and Reliability of the Concerns Based Adoption Model for Teacher Concerns in Education Reform

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Abstract

Bailey and Palsha (1992) proposed two modified versions of the Stages of Concern Questionnaire for measuring teacher concerns during a reform effort. Their analysis suggested the use of a five factor model with 35 items or 15 items rather than the original seven stage, 35-item Concerns Based Adoption Model. The present study was carried out in two phases. The first phase analyzed data from 376 algebra teachers to evaluate reliability and validity issues of both the original Stages of Concern Questionnaire and the two proposed versions of Bailey and Palsha. Reliability estimates were lower for the 15-item revised version, but agreed with Bailey and Palsha for the original instrument and the 35-item, five factor version. A confirmatory factor analysis was conducted using the five factor, 35-item version. A less than optimal fit of the model to the data indicated continued problems with validity. From factor loadings and modification indices, a 27-item five stage model was proposed that more closely matched the original CBAM without the Awareness and Refocusing Stages. The second phase of the study employed a confirmatory factor analysis of the 27-item five stage model to examine data from a new sample of 273 algebra teachers. Reliability estimates were consistently higher than for other versions, but validity continued to be problematic. A broad range of issues arising from these results are discussed.

Background

Current literature on teacher change emphasizes that change is a process not a single event (Friel, 1993; Fullan, 1991; Guskey, 1986; Hall & Hord, 1987). The Concerns Based Adoption Model (CBAM) provides a developmental framework for the role of teacher concerns in this change process. Designed in the early 1970's, the Stages of Concern Questionnaire (SoCQ) assesses the level of concern related to implementing an educational innovation (Hall, George and Rutherford, 1986). With the influx of current curriculum reform efforts, the questionnaire has been increasingly utilized in staff development projects as either a diagnostic or evaluative instrument for facilitating change (ERIC search). A recent book, *Staff development for education in the '90s* features the CBAM in a lead chapter (Loucks-Horsley & Stiegelbauer, 1991), describing its use in a wide variety of professional development environments.

As the SoCQ is used in an ever widening array of education and training settings it is vital to consider the extent to which results from the questionnaire are providing inservice coordinators and leaders accurate information about teacher concerns over proposed innovations. A study by Bailey and Palsha (1992) raised questions about both the reliability and validity of the seven scale model as a measure for teacher concerns. Using the same 35-item Stages of Concern Questionnaire (SoCQ), they suggested a revised five factor model. In addition, Bailey and Palsha hypothesized a shortened 15-item five factor questionnaire. The present study was carried out in two phases. The first phase analyzed data gathered from 376 algebra teachers who had taken the 35-item SoCQ as a part of a seven day inservice training program conducted during summer,

1992. The authors conducted reliability and validity studies in order to independently verify the work of Bailey and Palsha on their proposed revised questionnaires. From these analyses, a 27-item five stage model was suggested that might enhance the reliability and validity of the SoCQ. In the second phase, data were analyzed from a new sample of 273 algebra teachers involved in the same seven day inservice training conducted during summer, 1993. Reliability and validity analyses were carried out to attempt to verify the results from the first phase of the study.

Theoretical Framework

Based upon work by Fuller (1969), the Concerns Based Adoption Model proposes seven stages of concern as teachers implement a new innovation: Awareness, Information, Personal, Management, Consequence, Collaboration, and Refocusing. Research conducted as a part of the initial instrument development utilized principal component factor analysis with varimax rotation to reduce 150 original items from 363 respondents into the seven subscales. Validity and reliability issues addressed in a two and a half year study are reported by Hall, George, and Rutherford (1986). This work was followed by studies to verify the existence of the stages as a developmental process (Hall & Loucks, 1978). Since its development, the SoCQ has been used in more than fifty studies across disciplines to measure the level of teacher concerns with implementing an innovation (ERIC search).

A recent study by Bailey and Palsha (1992) conducted a factor analysis with data collected from 142 professionals working in intervention programs serving children with disabilities and their families. Their findings did not support the original 35-item, seven-

stage CBAM model. The authors found low reliability estimates for the Awareness stage (.42) and the Refocusing stage (.61). Five factors were found to provide the best model to fit the data for the 35 items. The authors identified the five reorganized stages as Awareness, Personal, Management, Impact, and Collaboration. In addition, the authors proposed a second, shorter 15-item SoCQ. Elimination of items was based upon low factor loadings, theoretical consistency with a factor, and equalization of the number of items per factor. A correlation between the five scale 35-item form and the five scale 15-item form revealed high compatibility for each factor (.87 to 1.00). The assignment of the 35-items from the SoCQ to the various stages proposed in each model is outlined in Table 1.

The Bailey and Palsha factor analysis produced a five factor, 35-item model with reliability estimates of .83, .81, .79, .74, and .60. Their reduced 15-item instrument contained reliability levels of .76, .73, .78, .74 and .55. Reliability estimates were somewhat lower for the five scale 15-item SoCQ but the authors considered these not to be "appreciably" lower. To check the validity of the five-factor 15-item revision, an exploratory factor analysis was applied to a random subset of 75 subjects from the original sample. Results showed the five factors did not change and no significant multiple loadings were found. The researchers suggested further studies were needed to generalize these results across innovations and trainees.

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Table 1 **Assignment of Items to Proposed Stages of Concern for the Original CBAM and the Modified-CBAM**

Item	CBAM	Modified CBAM
1. Don't know what the innovation is *	Awareness	Awareness
2. Not concerned about the innovation	Awareness	Management
3. Occupied with other things	Awareness	Management
4. Concerned with other things *	Awareness	Awareness
5. Not interested in learning	Awareness	Management
6. Limited knowledge about innovation *	Information	Awareness
7. Like to discuss possible use	Information	Personal
8. What resources are available	Information	Personal
9. Immediate requirements for use *	Information	Personal
10. How better than current practice	Information	Personal
11. Effects on professional status	Personal	Personal
12. Who will make the decisions	Personal	Personal
13. How my tasks will change *	Personal	Personal
14. Time and energy required	Personal	Personal
15. How my role will change *	Personal	Personal
16. Not enough time *	Management	Management
17. Conflict between interests and responsibilities *	Management	Management
18. Inability to manage	Management	Personal
19. Time spent on non-essential tasks	Management	Impact
20. Coordination of tasks and people *	Management	Management
21. Students' attitudes toward innovation	Consequences	Impact
22. How it affects students	Consequences	Impact
23. Evaluating impact on students *	Consequences	Impact
24. Exciting students about their part *	Consequences	Impact
25. Use of feedback to change *	Consequences	Impact
26. Help others with innovation *	Collaboration	Collaboration
27. Develop relationships with others *	Collaboration	Collaboration
28. Share progress with others *	Collaboration	Collaboration
29. Coordinate efforts with others	Collaboration	Collaboration
30. Know about others' work	Collaboration	Impact
31. Other approaches that are better	Refocusing	Impact
32. Revising use	Refocusing	Management
33. Revising the approach	Refocusing	Impact
34. Modify based on use	Refocusing	Impact
35. How to change	Refocusing	Personal

* Those items retained for the shorter 15-item version (stages stay the same)

Method

The subjects for the first phase of the present study were 376 algebra teachers who participated in a seven day inservice program at one of sixteen sites across North Carolina during summer, 1992. The subjects for the second phase of the study were 273 algebra teachers who participated in the same seven day inservice program at one of seventeen sites across North Carolina during summer, 1993. These workshops were a joint effort by the North Carolina Department of Public Instruction and the Center for Mathematics and Science Education at the University of North Carolina at Chapel Hill, intended to retrain mathematics teachers in revised pedagogy and curriculum for first year algebra. Both samples could be described as secondary and middle grades teachers with a primary interest in algebra and varying backgrounds regarding the new curriculum topics.

Teachers completed the 35-item SoCQ form on the first day of the training. The questionnaire contained Likert items with seven response categories ranging from 0 = irrelevant to me, 1 = not true of me now, to 7 = very true of me now. Written examples demonstrating how to classify degrees of concern were given to the teachers preceding the administration of the questionnaire.

The first phase of the study focused on generating reliability and validity data for the original SoCQ and the two revisions of the SoCQ suggested by Bailey and Palsha (1992). Using SPSS-X Release 4.1 for VAX/VMS (SPSS, 1990), Cronbach-alpha coefficients were computed as measures of internal consistency for the seven factors hypothesized by the original CBAM and the reduced five factor solutions proposed by Bailey and Palsha. Based on low reliability estimates for some factors of both the

original CBAM and the 15-item revision, a confirmatory factor analysis was only carried out on the 35-item, five factor SoCQ suggested by Bailey and Palsha to obtain goodness-of-fit indices. The analysis employed the VMS Prelis and LISREL 7 statistical packages (Joreskog & Sorbom, 1990)).

Results of the confirmatory analysis were also inspected to determine whether particular items among the 35 questions might either be eliminated from consideration or reassigned to different factors, thereby improving the validity of the overall instrument. Based on information obtained from both the standardized solutions and the modification indices generated by the analysis, a revised 27-item SoCQ emerged which would become the primary object of study of the second phase.

The second phase of the study focused on the analysis of the 27-item SoCQ with an independent sample. First, Cronbach-alpha coefficients were calculated using SPSS-X Release 4.1 for VAX/VMS (SPSS, 1990) to investigate internal consistency of the factors hypothesized by the original CBAM, the two five factor versions proposed by Bailey and Palsha (1992) and the 27-item SoCQ proposed by the present authors. Second, VMS Prelis and LISREL 7 (Joreskog & Sorbom, 1990) were utilized to conduct a confirmatory factor analysis investigating the validity of the 27-item, five factor model for measuring teacher concerns.

Results and Conclusions

First Phase Reliability Study

Reliability estimates for the three versions of the CBAM are displayed in Table 2. For the original CBAM, reliabilities of the Awareness and Refocusing subscales were very low (.45 and .52, respectively). These findings agreed with the results of Bailey and

Palsha (1992) who found reliabilities for Awareness and Refocusing stages to be .42 and .61, respectively. For the modified five-factor CBAM, general improvement in the Cronbach alpha values was found over those of the original model (Table 2). This outcome agrees with the results of Bailey and Palsha.

When reliability estimates were calculated for the same five subscales using Bailey and Palsha's 15-item shorter version of the SoCQ, the Cronbach-alpha values were lowered for four of the five stages. Two subscales had particularly low values, .57 for management and .50 for impact. Given these lower reliabilities for the proposed 15-item questionnaire as well as for the two subscales of the original CBAM, the present authors decided to carry out a validation study only for the 35-item, five factor modified-CBAM.

Table 2 Cronbach-alpha Values for the Original 35-item CBAM, the 35-item Modified-CBAM and 15-item Modified CBAM

CBAM Stages		Modified-CBAM Stages	35-items	15-items
Awareness	.45	Awareness	.71	.71
Information	.66	Personal	.82	.79
Personal	.72	Management	.63	.57
Management	.69	Impact	.68	.50
Consequences	.60	Collaboration	.76	.71
Collaboration	.77			
Refocusing	.52			

First Phase Confirmatory Factor Analysis

The 35-item, five stage model was submitted to a confirmatory factor analysis to determine the extent to which the items of the questionnaire are appropriate measures of the hypothesized stages. Skewness and kurtosis information for each of the 35 variables indicated that the data did not violate normality assumptions of the analysis. Prelis produced a variance-covariance matrix, with an effective sample size of N=376, which was used as the input matrix for a maximum likelihood extraction procedure in LISREL.

One variable for each of the five factors was set as a reference indicator, and its loading was fixed to be 1.0. Values for the remaining 30 factor loadings and their error variances were estimated as a part of the analysis (Long, 1983).

LISREL produces four goodness-of-fit measures: Chi-square, Goodness of Fit Index (GFI), Adjusted GFI (AGFI), and Root Mean Square Residual (RMSR). The values for these indices are displayed in Table 4. Since the RMSR is difficult to interpret when using a variance-covariance input matrix as used in this confirmatory factor analysis, it will not be considered here. With the Chi-square measure, a value close to the degrees of freedom of the model would indicate a good fit to the data. In this case, the Chi-square value is much larger. However, a Chi-square measure tends to be inflated by large sample sizes and should be considered in conjunction with the GFI and AGFI measures.

The GFI represents the ratio of squared residuals to observed variances and can take on values between zero (poorest fit) and one (perfect fit). The AGFI is a type of parsimonious fit index, which adjusts GFI for degrees of freedom. Typically, AGFI will be comparable with GFI unless an unusually large number of measures have been used in the model. In the case of an excellent fit of the model to the data, GFI would be at least 0.90 and AGFI would be at least .80 (Miller & Thayer, 1989). Thus, the GFI and AGFI values in the table would be considered to be less than optimal. The smaller AGFI in this case indicates that, as Bailey and Palsha have theorized, an SoCQ with fewer items might be a more parsimonious measure of teacher concerns.

Table 3 Goodness of Fit Measures

Chi-square with 565 d.f.	= 2307.24 (p=.000)
GFI	= 0.733
AGFI	= 0.702
RMSR	= 0.527

Given the less than optimal fit of the model to the data, it was considered important by the present authors to investigate possible sources for the lack of fit. This type of inquiry is made feasible using the LISREL option for specifying modification indices for the model. These modification indices represent the amount the Chi-square index for the model would be decreased by allowing an item to be assigned to a different subscale. Table 4 displays the questionnaire items with modification indices greater than 20 for a given factor.

Table 4 SoCQ Items with Modification Indices Greater Than 20 for a Factor

Item	Aware	Personal	Manage	Impact	Collaborate
Concerned about the area	0.000	20.478	3.238	9.671	1.115
Like to discuss possible use	0.790	0.000	0.780	15.368	54.252
Effects on professional status	0.000	0.000	28.374	0.720	0.247
Inability to manage	0.005	0.000	49.572	0.238	10.971
Time spent in nonessential tasks	4.796	24.274	43.189	0.000	0.380
Evaluating impact on students	10.832	20.462	0.710	0.000	0.098
Exciting students about their part	0.391	0.079	11.647	0.000	26.122
Share progress with others	0.029	4.512	0.020	24.758	0.000
Coordinate efforts with others	1.091	19.451	0.703	24.254	0.614
Know about others' work	1.744	27.860	0.070	0.000	20.631
Other approaches that are better	96.383	16.549	0.086	0.000	8.407
Revising use	7.614	40.022	0.296	22.792	3.398
Revising the approach	31.876	1.152	2.069	0.000	6.513
How to change	3.074	15.485	5.153	13.155	22.279

In considering the elimination or reassignment of measures of the various stages, it is important also to consider the loading of each item on its hypothesized factor. Table 5 provides the completely standardized solution for each item of the questionnaire. Smaller values indicate that the item might either be reassigned or eliminated, depending on the modification indices for the item.

Table 5 Standardized Solutions

Item	Aware	Personal	Manage	Impact	Collaborate
Don't know what the innovation is	.80				
Concerned with other things	.57				
Limited knowledge about innovation	.64				
Like to discuss possible use		.50			
What resources are available		.53			
Immediate requirements for use		.79			
How better than current practice		.56			
Effects on professional status		.40			
Who will make the decisions		.51			
How my tasks will change		.72			
Time and energy required		.71			
How my role will change		.75			
Inability to manage		.53			
How to change		.51			
Not concerned about the innovation			.10		
Occupied with other things			.43		
Not interested in learning			.32		
Not enough time			.52		
Conflict between interests and responsibilities			.62		
Coordination of tasks and people			.54		
Revising use			.54		
Time spent on non-essential tasks				.34	
Students' attitudes toward innovation				.42	
How it affects students			.39		
Evaluating impact on students				.53	
Exciting students about their part				.46	
Use of feedback to change				.51	
Know about others' work				.49	
Other approaches that are better			.15		
Revising the approach			.52		
Modify based on use				.55	
Help others with innovation					.67
Develop relationships with others					.64
Share progress with others					.69
Coordinate efforts with others					.63

If items are eliminated based upon a low standardized solution value for the assigned stage, a value < .50, and low values for modification indices, values < 20, five questions would be removed from the questionnaire. These include:

–Not concerned about the innovation (Management)

–Occupied with other things (Management)

–Not interested in learning (Management)

–Students' attitudes toward innovation (Impact)

–How it affects students (Impact)

All three of the questions that are listed in the Management subscale above were questions that shifted from the Awareness stage to the Management stage in Bailey and Palsha's five factor model. It seems reasonable from the data to drop the three questions. These items were also eliminated by Bailey and Palsha when constructing their 15-item version of the questionnaire. Although the data suggest that the two questions from Impact be eliminated, the present authors feel that focusing on student learning is an important aspect of the CBAM concept and should remain in the model.

Four other items have standardized solution values between .50 and .60 and modification indices less than 22.

–What resources are available (Personal)

–How better than current practice (Personal)

–Modify based on use (Impact)

–How to change (Personal)

Due to the length of the Personal subscale, it was decided to eliminate the first two questions . The last two questions are items that shifted from the Refocusing factor to the Impact and Personal factors. Conceptually, these items are not consistent with the new factors and may be eliminated. All four of the above questions were also dropped by Bailey and Palsha for their 15-item questionnaire. By removing a total of seven questions, the new 5-factor modified CBAM would consist of 28 questions.

The other consideration in modifying the model is the reassignment of items. If items are reassigned based upon low standardized solution values for the assigned stage,

< .55, but higher modification indices, > 20, six items would be reassigned on the questionnaire. By reassigning these items, the Chi-square index would decrease by the amount indicated by the modification index for the new factor. The original stage and suggested movement stage are indicated in the parenthesis, followed by the modification index for the new stage:

- Like to discuss possible use (Personal→Collaboration, 54.3) *
- Effects on professional status (Personal→Management, 28.4)
- Inability to manage (Personal→Management, 49.6)*
- Time spent on non-essential tasks (Impact→Management, 43.2) *
- Exciting students about their part (Impact→Collaboration, 26.1)
- Know about others' work (Impact→Personal, 27.9)
- Other approaches that are better (Impact→Awareness, 96.4) *
- Revising the approach (Impact→Awareness, 31.9)

Four of the above questions, "effects on professional status," "exciting students about their part," "knowing about others' work," and "revising the approach" were considered by the authors to be conceptually linked to the hypothesized factors and therefore were not reassigned. These questions would not have as large an effect on the Chi-square index since they represented the smallest modification indices among the items. The starred questions above are items the authors decided to reassign. These movements better equalized the number of questions per scale. Reliability estimates were recalculated for the subscales. With the additional question, "Other approaches that are better," the Awareness subscale reliability lowered substantially (.11). If the item is moved back to Impact, the reliability for Impact is low (.59). The authors decided to drop this question, leaving the original three questions in Awareness and a total of 27 questions for the new instrument. The final reliability estimates for the instrument were

Awareness=.71, Personal=.75, Management=.73, Impact=.66 and Collaboration=.77.

The questions for each subscale are shown in Table 6.

Table 6 Twenty-Seven Item Five Factor SoCQ

Stage 1 - Awareness
Don't Know What innovation is
Concerned with other things
Limited Knowledge about innovation
Stage 2 - Personal
Immediate requirements for use
Effects of professional status
Who will make the decisions
How my tasks will change
How my role will change
Time and energy required
Stage 3 - Management
Not enough time
Conflict between interests and responsibilities
Inability to manage
Coordination of tasks and people
Time spent on non-essential tasks
Revising use
Stage 4 - Impact
Students attitude toward innovation
How it affects students
Evaluating impact on students
Exciting students about their part
Use of feedback to change
Revising the approach
Know about others' work
Stage 5 - Collaboration
Like to discuss possible use
Help others with innovation
Develop relationships with others
Share progress with others
Coordinate efforts with others

Reliability estimates for the data from this sample did not support the 15-item five-factor CBAM proposed by Bailey and Palsha (1992). Although the idea of a much shorter 15-item SoCQ would be appealing for teachers completing the form and for

training coordinators analyzing SoCQ items, reducing the number of questions from 35 to 15 with only three items per scale is tenuous, losing much of the detail of the conceptual model. The 27-item five-factor instrument proposed in this study eliminates unnecessary and inappropriate questions for the conceptual model without distorting the meaning of the subscales. The reliability estimates were sufficiently strong to warrant the use of the proposed 27-item questionnaire.

This new 27-item SoCQ matches more closely the original CBAM, but without the Awareness and Refocusing stages that had low reliabilities. Three items from the original Awareness subscale that shifted to the Management scale were eliminated from Management in this study, as suggested by the analysis. Results of the analysis also suggested removal of three items from the original Refocusing subscale. The remaining two Refocusing items were now in the Management and Impact stages. The second phase of the study examined the reliability and validity of the new 27-item model.

Second Phase Reliability Study

Reliabilities for each of the models were computed using data from the second workshop. Reliability estimates are displayed in Table 7. With the new sample, reliabilities for the 27-item SoCQ remained stable. Several factors for the Bailey and Pasha models continue to be below .60.

Second Phase Validity Study

Prelis produced a variance-covariance matrix, with an effective sample size of N=241, which was used as the input matrix for a maximum likelihood extraction

procedure in LISREL. One variable for each of the five factors was set as a reference indicator, and its loading was fixed to be 1.0. Values for the remaining 22 factor loadings

Table 7 Cronbach-alpha Values for the Original CBAM, the Different Versions of the Modified CBAM (27-item, 35-item, 15-item)

Original CBAM	27-Item, Modified	35-Item, Modified	15-Item, Modified
Awareness = .42	Awareness = .71	.70	.73
Information = .58	Personal = .76	.80	.68
Personal = .71	Management = .69	.54	.56
Management= .63	Impact = .68	.71	.51
Consequence= .64	Collaboration = .72	.73	.69
Collaboration=.74			
Refocusing =.48			

and their error variances were estimated as a part of the analysis. Goodness-of-fit indices produced by the confirmatory factor analysis are shown in Table 8. Although the p-value suggests to reject the model, with a large degree of freedom the Chi-square value tends to be inflated. The Chi-square should be considered along with the GFI and ADFI. An excellent fit would have a GFI of .90 or above with a ADFI at least .80. The values for this model indicate a somewhat better fit than the confirmatory results for the 35-item five factor Bailey and Palsha model in the first phase study. However, the 27-item model remains a less than optimal fit.

Table 8 Goodness of Fit Measures

Chi-square with 329 d.f.	= 1043.85 (p=.000)
GFI	= 0.760
AGFI	= 0.724
RMSR	= 0.523

An exploratory examination of the standardized solution values and modification indices suggested values for only two questions that might warrant movement or

omission of questions. The item, "I am concerned about time spent working with nonacademic problems related to the innovation" (Management stage), had a standardized solution value < .50 and modification indices < 20 indicating the question could be dropped. The item, "I would like to discuss the possibility of using the innovation" (Collaboration stage) had a standardized solution value < .50 with one modification index > 20 suggesting that the question could be moved to the Personal stage. However, these two changes would make very little difference in the Chi-square, GFI and AGFI results.

In a similarly exploratory use of the LISREL procedure, the same 1993 data were analyzed using the original 35-item, seven scale CBAM. The goodness-of-fit values were consistently poorer than for the 27-item questionnaire: Chi-square = 1779.62 (567 d.f.), GFI = 0.667, and AGFI = 0.630.

Discussion

Although the Concerns Based Adoption Model has been accepted over the years as an appropriate framework for identifying levels of concerns for teachers, our data supported findings of Bailey and Palsha (1992) concerning the low reliability of the Awareness and Refocusing subscales. Clearly, these studies indicate that results from the two stages should be interpreted with extreme caution.

Bailey and Palsha (1992) hypothesized that the Awareness subscale may not be needed in the model. For the first set of data from the algebra teachers, average percentile scores were high for both the Awareness and Information stages. The main difference between these two stages is that in Stage 0, Awareness, teachers may have little concern or involvement with the innovation, whereas in Stage 1, Information, teachers are aware

of the innovation and want more information. With the 35-item modified CBAM, all questions from the original Information stage factored to the Personal stage leaving one succinct entry level stage rather than two. Two questions from the original Awareness stage, "I'm not concerned about this innovation," and "I am completely occupied with other things," shifted to the Management Factor in the modified version. A correlation matrix generated from the first dataset revealed that these two questions had very low correlations with the other questions in the Awareness subscale ($r = -.06$ to $r = .21$). Also, four of the original Awareness questions are negatively stated which might cause confusion for teachers. Thus, the present findings indicated a lack of support for the Awareness subscale.

Bailey and Palsha (1992) also hypothesized that the Refocusing subscale may not be needed in the model. Data from the SoCQ for the first group of algebra teachers also showed a high percentile level at the Refocusing stage. It would seem that teachers at a high Awareness/Information level would have a low percentile for Refocusing on ways to implement the new innovation. In the manual by Hall, George, and Rutherford (1986) developed for use with interpreting CBAM data, the authors discuss the interpretation of a "tail-up" with teachers not yet using the new innovation (non-users). Rather than Refocusing on the new ways to implement the innovation, non-users with high Awareness and Information levels, low Consequence and Collaboration levels and high Refocusing, may have ideas other than the new innovation to implement. In other words, these teachers are likely to be negative toward the innovation and not want to change. This difficulty in interpreting a high percentile for the Refocusing stage may help explain

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low reliabilities for this subscale. Staff development efforts utilizing the original CBAM need to be aware of the low reliability results found in this study and in that of Bailey and Palsha.

The reliability estimates found in this study were acceptable for the 35-item, five factor questionnaire produced from the exploratory factor analysis of Bailey and Palsha (1992). However, the first phase confirmatory factor analysis demonstrated that the validity of the model was less than optimal for the first group of algebra teachers. Results from the analysis indicated a need for modifications to the 35-item modified CBAM. Thus, a more parsimonious questionnaire was generated by the present authors in the form of a 27-item SoCQ. This model was then examined to determine whether it was more valid than the versions previously tested for measuring teacher concerns.

Results from the second phase of the study showed that the 27-item SoCQ continued to be more reliable than Bailey and Palsha's five factor versions. However, the validity of the 27-item instrument was still problematic. Even though the five factor model seemed conceptually reasonable, it was not clear from the analysis what the factors represented. These results seem to indicate that the CBAM needs to be modified in terms of the questions being asked, not simply the grouping or number of the questions. The data for the second sample continued to reflect that the questions themselves appear to be only weakly related to the hypothesized stages of concern. With regard to the 27-item SoCQ, it is as if we now have a room full of weather forecasters who are in complete agreement that tomorrow's weather will be warm and sunny (good reliability), but when tomorrow comes the weather is cold and rainy (weak validity). Needless to say,

given the reality of the widespread use of the SoCQ in a variety of professional development settings, this result is unsettling. Staff developers who use the existing SoCQ as a diagnostic or evaluative tool should be wary of the potential difficulties of interpreting project evaluation data generated by the questionnaire and the potential pitfalls of using the data for modifying training to better address teacher concerns.

Despite the difficulties with the original SoCQ demonstrated by both this study and that of Bailey and Palsha (1992), research on staff development has shown that teachers do have differing stages of concern as they implement a new innovation (Friel, 1993; Fullan, 1991; Guskey, 1986). It is tempting to look for a way to quickly and easily gather quantitative data, especially for large groups, that reflects the level of these concerns. However, this may either be much more difficult than it appears, or simply impossible. One viable solution to the difficulty of obtaining data on teacher concerns is for staff development leaders to concentrate some of their efforts on acquiring more qualitative information. Loucks-Horsley and Stiegelbauer (1991) recognizes that even valid information gathered from the SoCQ does not help to identify what the precise concerns are for teachers, and so they recommend the use of open-ended questions as well as informal discussions for pinpointing more accurately the critical issues in a reform effort.

Crawford, Newberry and Fimbel (1996) reported on a project aimed at identifying middle school teacher concerns about an innovation through the use of teacher journals. The authors analyzed journal entries from 12 teachers who attended a two week professional development workshop on new methods for teaching pre-algebra. The

authors classified concerns according to five of the stages of concern from the original CBAM, Information, Personal, Management, Consequences and Collaboration, and also went beyond the CBAM to attempt to classify new categories as they emerged from the data. New categories included difficulty of implementation, preparedness for implementation, planning for implementation, and the new curriculum itself. One difficulty of implementation teachers identified was a lack of direct transfer for students between the use of manipulatives and the formation of abstract concepts (e.g., the concept of a variable). As the authors note, this example provides rich information about teacher concerns. The depth of this information would allow workshop leaders to move beyond a simple understanding such as "Some teachers are concerned about implementing the innovation," to a more substantive consideration of the types of prescriptive methods that might be used to assist teachers in implementation. In general, through the use of open-ended questions and journal entries, staff development coordinators can be more certain of their diagnosis of teacher concerns and therefore more confident in their methods for addressing those concerns.

Summary

Results of this study have significant implications for staff developers and researchers using the SoCQ. Data generated from the SoCQ need to be interpreted with caution, and careful redesign of questions and subscales of the SoCQ should be considered in order to more accurately measure the Stages of Concern. Qualitative data from open-ended questions or journals might be considered as a means of gathering detailed information concerning issues teachers face as they implement an innovation.

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